34. (New) The method of Claim 33, wherein the anti-cancer synergism is potentiation.

35. (New) The method of Claim 33, wherein the composition induces cell cycle arrest in cells of the cancer, inhibits proliferation of cells of the cancer, induces apoptosis in cells of the cancer, or synchronizes cell cycles of cells of the cancer.

36. (New) The method of Claim 33, wherein the cancer is leukemia, lymphoma or melanoma.

37. (New) The method of Claim 33, wherein cells of the cancer display resistance against one or more chemotherapeutic agents.

38. (New) The method of Claim 33, wherein the chemotherapeutic agent is administered before, after, or concurrently with the administration of the composition.

39. (New) The method of Claim 33, wherein the chemotherapeutic agent is a DNA cross-linking agent, a DNA depolymerizing agent, an antimetabolic agent, an anti-tumor antibiotic agent, a topoisomerase inhibiting agent or a tubulin stabilizing agent.

40. (New) The method of Claim 33, wherein the chemotherapeutic agent is mitomycin-C, 5-fluorouracil, or cisplatin.

41. (New) A method of treating cancer comprising administration of a composition comprising *Mycobacterium phlei (M. phlei)*-DNA (M-DNA) and a pharmaceutically acceptable carrier to an animal having cancer, wherein the composition and a chemotherapeutic agent administered to the animal having cancer display an anti-cancer synergism.

42. (New) The method of Claim 41, wherein the anti-cancer synergism is potentiation.

43. (New) The method of Claim 41, wherein the composition induces cell cycle arrest in cells of the cancer, inhibits proliferation of cells of the cancer, induces apoptosis in cells of the cancer, or synchronizes cell cycles of cells of the cancer.

44. (New) The method of Claim 41, wherein the cancer is leukemia, lymphoma or melanoma.

45. (New) The method of Claim 41, wherein cells of the cancer display resistance against one or more chemotherapeutic agents.

46. (New) The method of Claim 41, wherein the chemotherapeutic agent is administered before, after, or concurrently with the administration of the composition.

47. (New) The method of Claim 41, wherein the chemotherapeutic agent is a DNA cross-linking agent, a DNA depolymerizing agent, an antimetabolic agent, an anti-tumor antibiotic agent, a topoisomerase inhibiting agent or a tubulin stabilizing agent.

48. (New) The method of Claim 41, wherein the chemotherapeutic agent is mitomycin-C, 5-fluorouracil, or cisplatin.

49. (New) A method of treating cancer comprising administration of a composition comprising a mycobacterial DNA complexed on mycobacterial cell wall (BCC) and a pharmaceutically acceptable carrier to an animal having cancer, wherein the composition and a chemotherapeutic agent administered to the animal having cancer display an anti-cancer synergism.

50. (New) The method of Claim 49, wherein the anti-cancer synergism is potentiation.

51. (New) The method of Claim 49, wherein the composition induces cell cycle arrest in cells of the cancer, inhibits proliferation of cells of the cancer, induces apoptosis in cells of the cancer, or synchronizes cell cycles of cells of the cancer.

52. (New) The method of Claim 49, wherein the cancer is leukemia, lymphoma or melanoma.

53. (New) The method of Claim 49, wherein cells of the cancer display resistance against one or more chemotherapeutic agents.

54. (New) The method of Claim 49, wherein the chemotherapeutic agent is administered before, after, or concurrently with the administration of the composition.

55. (New) The method of Claim 49, wherein the chemotherapeutic agent is a DNA cross-linking agent, a DNA depolymerizing agent, an antimetabolic agent, an anti-tumor antibiotic agent, a topoisomerase inhibiting agent or a tubulin stabilizing agent.

56. (New) The method of Claim 49, wherein BCC is derived from *M. vaccae, M. chelonei, M. smegmatis, M. terrae, M. duvalii, M. tuberculosis, M. bovis BCG, M. avium, M. Szulgai, M. scrofulaceum, M. xenopi, M. kansaii, M. gastr, M. fortuitous,* or *M. asiaticum.*

57. (New) A method of treating cancer comprising administration of a composition comprising a mycobacterial DNA (B-DNA) and a pharmaceutically acceptable carrier to an animal having cancer, wherein the composition and a chemotherapeutic agent administered to the animal having cancer display an anti-cancer synergism.

58. (New) The method of Claim 57, wherein the anti-cancer synergism is potentiation.

59. (New) The method of Claim 57, wherein the composition induces cell cycle arrest in cells of the cancer, inhibits proliferation of cells of the cancer, induces apoptosis in cells of the cancer, or synchronizes cell cycles of cells of the cancer.

60. (New) The method of Claim 57, wherein the cancer is leukemia, lymphoma or melanoma.

61. (New) The method of Claim 57, wherein cells of the cancer display resistance against one or more chemotherapeutic agents.

62. (New) The method of Claim 57, wherein the chemotherapeutic agent is administered before, after, or concurrently with the administration of the composition.

63. (New) The method of Claim 57, wherein the chemotherapeutic agent is a DNA cross-linking agent, a DNA depolymerizing agent, an antimetabolic agent, an anti-tumor antibiotic agent, a topoisomerase inhibiting agent or a tubulin stabilizing agent.

64. (New) The method of Claim 57, wherein B-DNA is derived from *M. vaccae, M. chelonei, M. smegmatis, M. terrae, M. duvalii, M. tuberculosis, M. bovis BCG, M. avium, M. Szulgai, M. scrofulaceum, M. xenopi, M. kansaii, M. gastr, M. fortuitous,* or *M. asiaticum.*